BreezeNET® B130/B300 GigE

Quick Start Guide

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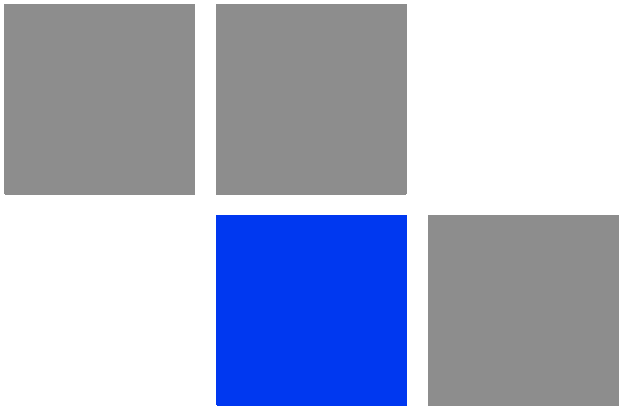
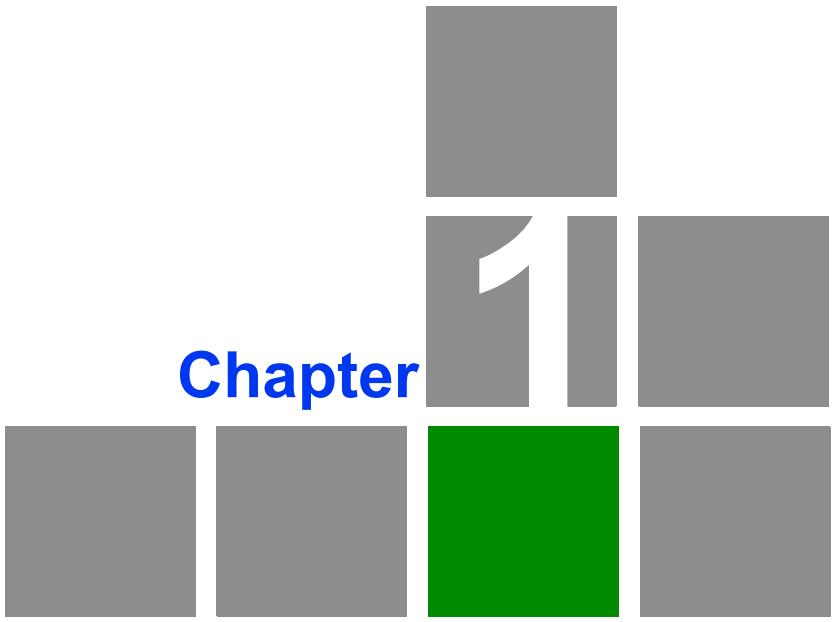




Chapter 1

Getting Started

In This Chapter:

- "Scope of Document" on page 3
- "Abbreviations" on page 4
- "Document Marks" on page 5
- "Additional Information" on page 6

This document is designed to help engineers/technicians in rapid configuring of the system. The document includes detailed instructions for first configuration steps and configuration scenarios for typical network topologies.

1.1 Scope of Document

This document consists of the following chapters:

- “Getting Started” on page 1 - This chapter includes the information about this document purpose and structure.
- “Getting Access to the Unit” on page 7 - The chapter describes how to get access to the device via Console Port and to configure Ethernet port.
- “Point-to-Point Configuration” on page 24 - This chapter includes a comprehensive list of instructions for point-to-point link configuration including providing LAN connectivity.
- “Performing Outdoor Testing” on page 40 - The chapter contains a list of requirements for outdoor testing. Also some basic steps for link improvement and antenna alignment are presented.

1.2 Abbreviations

The following abbreviations are used in this document:

- ODU - Outdoor Unit
- IDU - Indoor power supply Unit
- RF cable - Radio Frequency cable to connect ODU and antenna
- LOS - Line-of-Sight
- STP cable - Shielded Twisted Pair cable to connect ODU and IDU. FTP (Foiled Twisted Pair) CAT5e also can be used
- PTP - Point-to-Point topology
- MINT - Microwave Interconnection NeTworks

1.3 Document Marks

CAUTION

All warnings are marked with a special warning sign. One should pay a great deal of attention to what is written in the Warning sections.

NOTE

All notes are marked with a special note sign. Notes usually contain useful comments or hints to the described section of the document.

1.4 Additional Information

Additional information which is not included in this Manual can be found in the following sources:

- Device passport located in the box with the device
- Technical User Manual
- WANFleX OS User Guide

Chapter 2

Getting Access to the Unit

In This Chapter:

- "PC/Laptop/LAN Connection" on page 9
- "Initial Setup" on page 20

2.1 PC/Laptop/LAN Connection

2.1.1 Cabling (Lab)

The sequence of actions to be performed in order to connect the unit to the PC/Laptop is the following:

1. Unpack the equipment
2. If you do not have a service cable soldered, please do it using special connectors included into the package according to the soldering scheme located in the "Supplementary information" section. STP cable cat 5 or cat 5E should be used.
3. Locate IDU and ODU. Using STP Service cable connect ODU and IDU. Service cable sockets are marked on the diagrams below

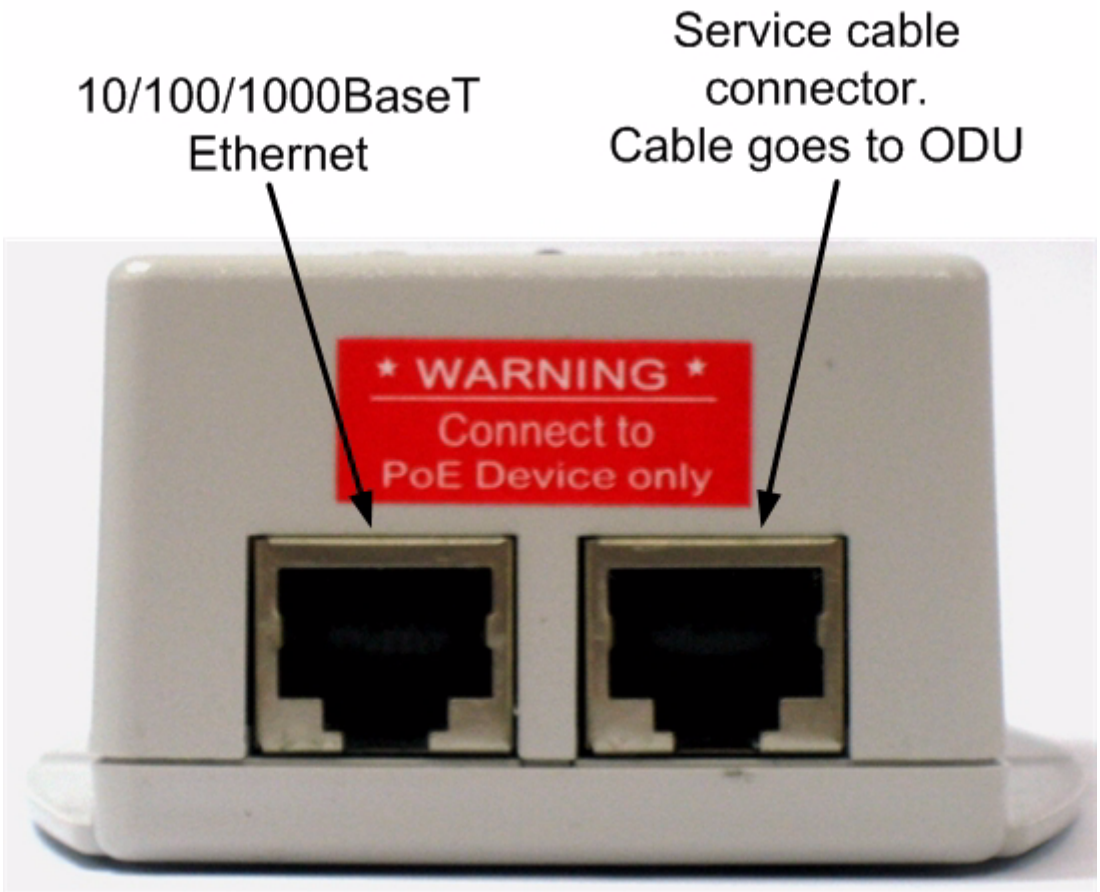


Figure 2-1: IDU Front

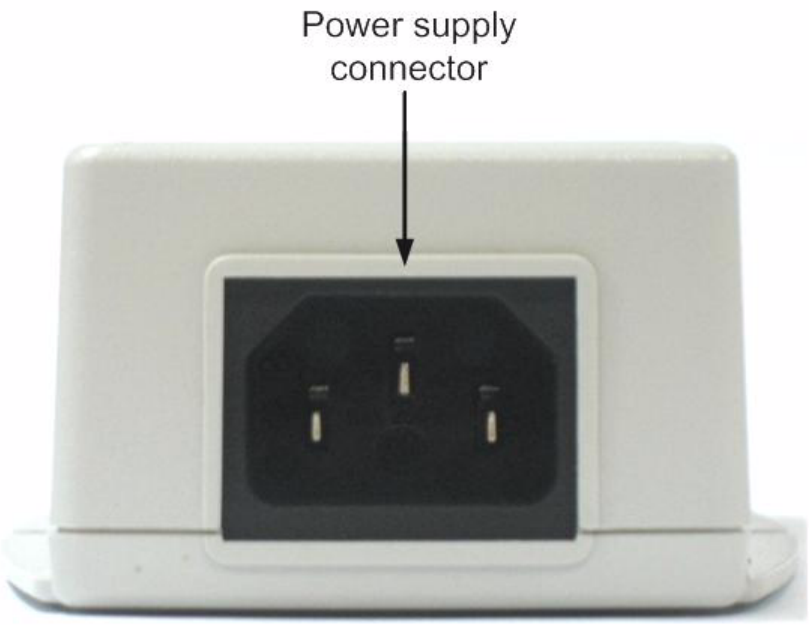


Figure 2-2: IDU Rear

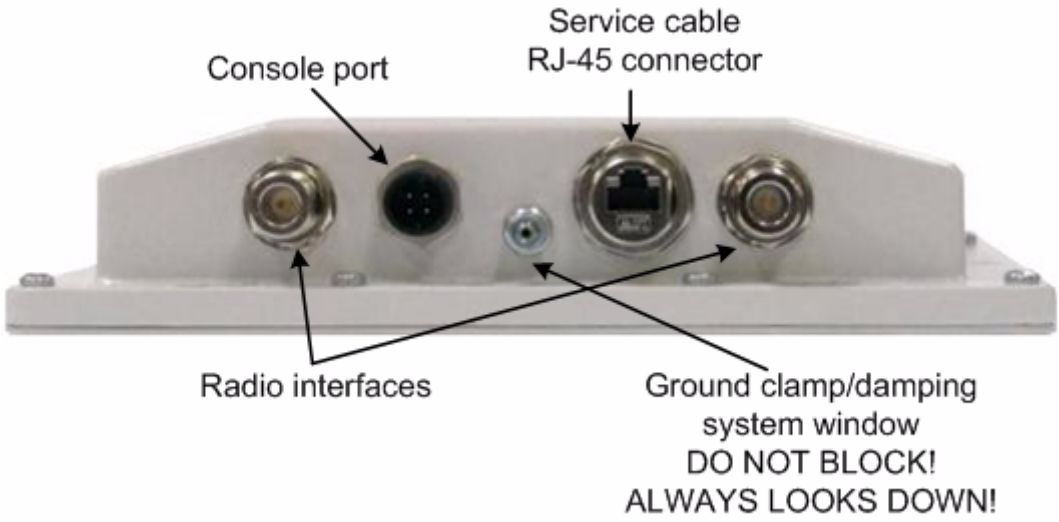


Figure 2-3: ODU Front

2.1.2 Accessing the Unit via Console

If you cannot get access to the unit using procedure described in "Accessing the unit via Ethernet" section please follow the steps described in this section.

1 Using Console Cable, please connect the unit's console port (see Figure 2-3) to the COM-port of your PC/Laptop.

NOTE

In order to accomplish the steps described in this section your PC/Laptop must be equipped with a COM-port

2 Locate the power cord in the package

3 Plug the power cord into the IDU power supply connector and to the power supply socket (220V 50 Hz or 110V 60 Hz depending on the country of residence)

4 Green power indicator on the IDU must light up

5 Power your PC/Laptop on

NOTE

Following step's screenshots are taken from Microsoft Windows XP. You can also perform this procedure in Microsoft Windows 98/NT/2003

6 Run HyperTerminal. See Figure 2-4.

Figure 2-4: Locating the HyperTerminal

7 Indicate connection name (e.g. "Lab Test") and specify the COM-port name to which the unit is connected. See Figure 2-5.

Figure 2-5: Selecting the Port

8 Specify port parameters exactly as shown on Figure 2-6.

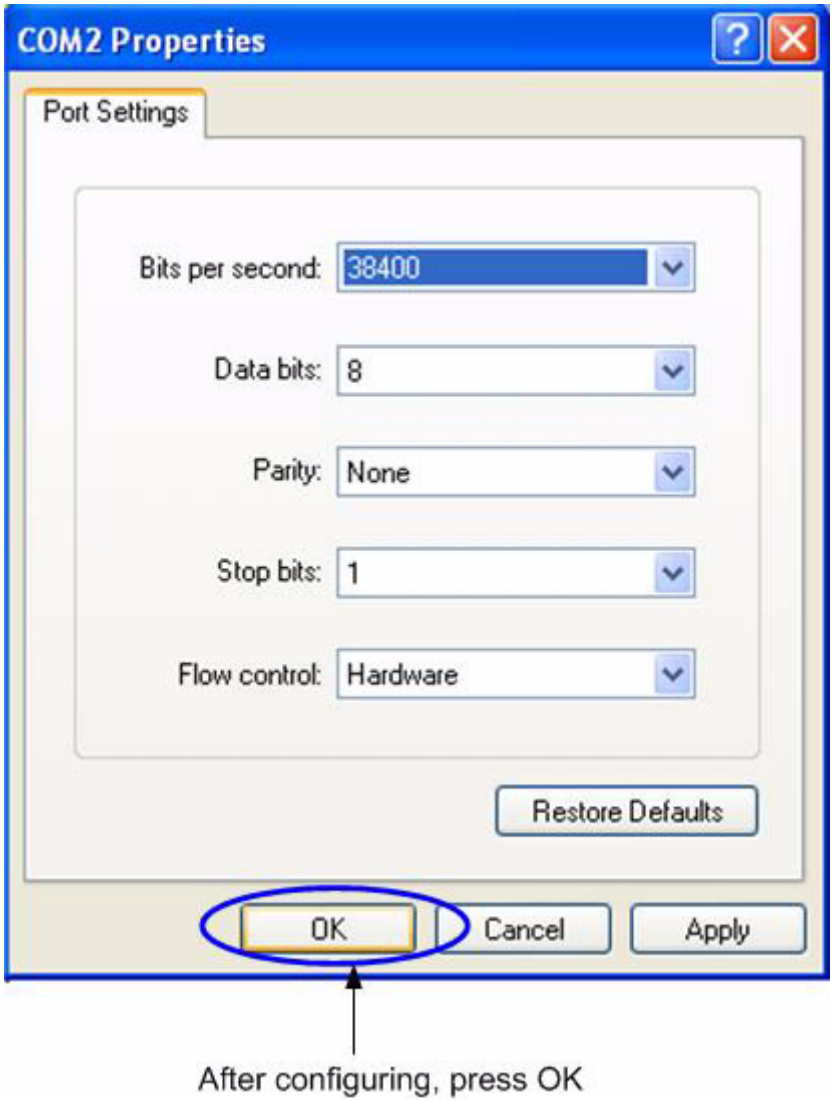


Figure 2-6: Port Parameters

9 If you connected everything properly, selected the right port and made its configuration right, after pressing enter on the white blank screen (after step 8) you should see WANFleX OS prompt as shown on Figure 2-7.

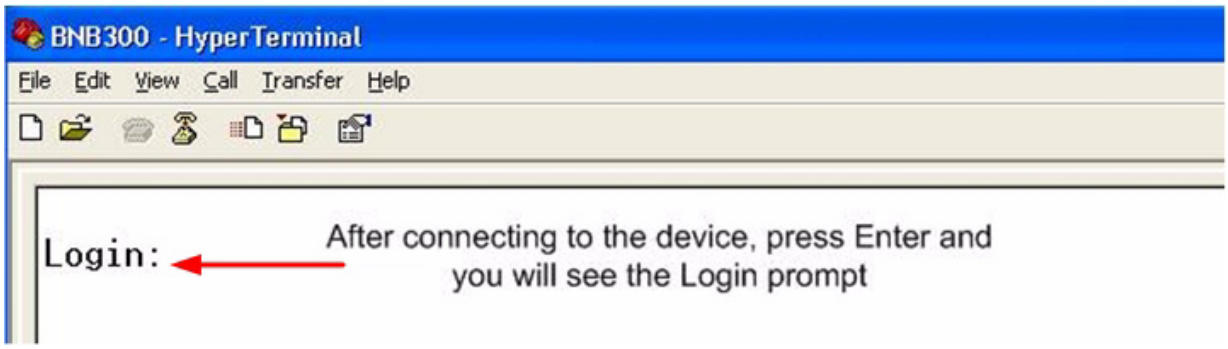

BNB300 - HyperTerminal
File Edit View Call Transfer Help
Login:
After connecting to the device, press Enter and
you will see the Login prompt

Figure 2-7: WANFleX OS Prompt

10 Your device has a factory configuration. The default login is "admin" and the default password is "private".

11 Once this is done, you will see WANFleX CLI (Command Line Interface). See Figure 2-8.

```
Login:admin
Password:



 ¦ BreezeNET B300
 ¦ Alvarion Ltd.
 ¦ www.alvarion.com

Unknown node

SETUP CORRECT DATE & TIME via "date" or "sntp" command

#1>
```

Figure 2-8: WANFlex CLI

12 In order for your unit to be accessible from your LAN/PC/Laptop via Ethernet, you should configure **eth0** interface IP-address so the unit would allocate in the desired LAN (or accessible from your PC/Laptop Ethernet adapter). Your can change this IP-address via "**ifc eth0**" command as shown on figure 9. After changing the IP-address, save the configuration using "**co sa**" command. In the example given the IP-address being assigned to **eth0** interface is **9.1.8.1** with mask length 24 (255.255.255.0). In order to check whether your changes were correct, use "**co sh ifc**" command which shows configuration for all interfaces of the unit. Do not forget to save your configuration using "**co sa**" (config save) command.

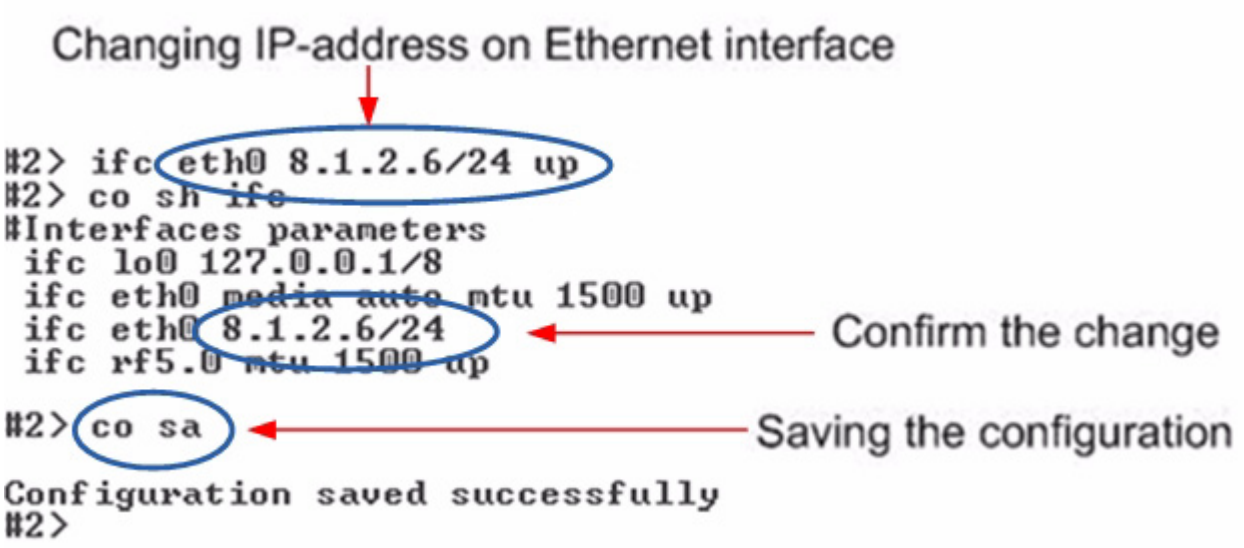


Figure 2-9: Changing the IP Address on eth0 Interface

13 If all your settings are correct you can connect the unit to your LAN using UTP cable with RJ-45 connectors (Ethernet port of the unit is located on IDU).

2.1.3 Accessing the Unit via Ethernet

If your PC/Laptop does not have a COM-port or you want to plug the unit to the LAN switch you can configure it using Telnet protocol.

The default IP-address assigned to the **eth0** interface of the unit is **10.10.10.1** with 255.255.255.0 mask.

If you connect the unit directly to the LAN/PC/Laptop you should either change the IP-address on the Ethernet adaptor or create an alias IP-address which would be located in **10.10.10.0/24** network.

Connect the unit to LAN/PC/Laptop using UTP cable with RJ-45 connectors.

The procedure is the following:

1 Open the Control Panel in Windows. See Figure 2-10.

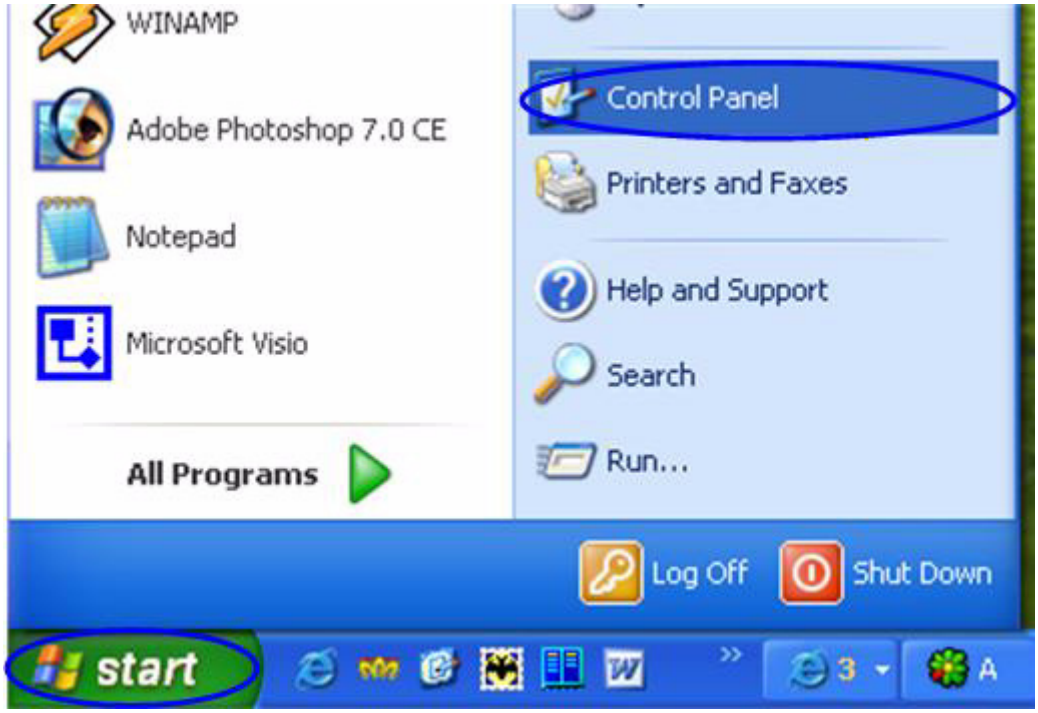


Figure 2-10: Opening the Control Panel

2 Open "Network connections" icon. See Figure 2-11.

Figure 2-11: Network Connections

3 In "Network connections" folder right mouse button click on the LAN connection and click "Properties". See Figure 2-12.

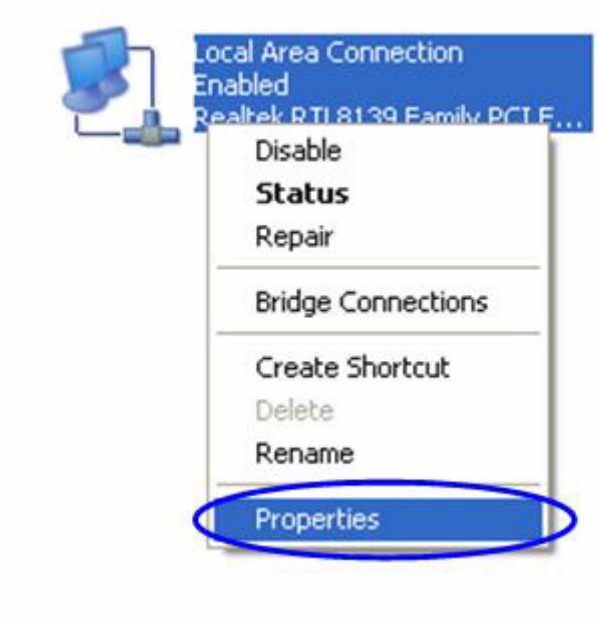


Figure 2-12: Connection Properties

4 Choose "Internet protocol (TCP/IP)" and click "Properties". See Figure 2-13.

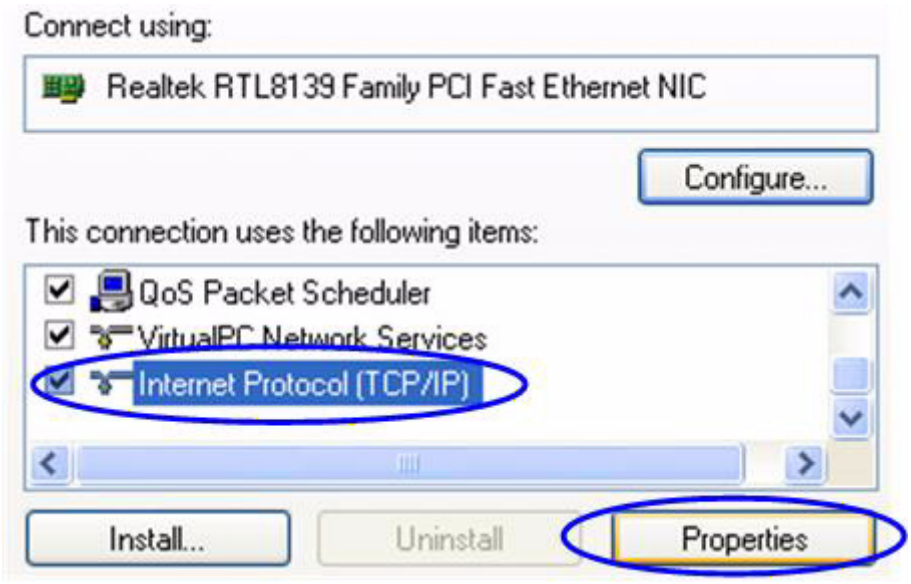


Figure 2-13: Internet Protocol Properties

5 If you want to connect to the unit using PC/Laptop you can just change an IP-address on the Ethernet adaptor to some address from 10.10.10.0/24 network (e.g. change "IP-address" field to "**10.10.10.2**" and "Subnet mask" to "**255.255.255.0**"). After that click **OK** and move to step 7. See Figure 2-14.

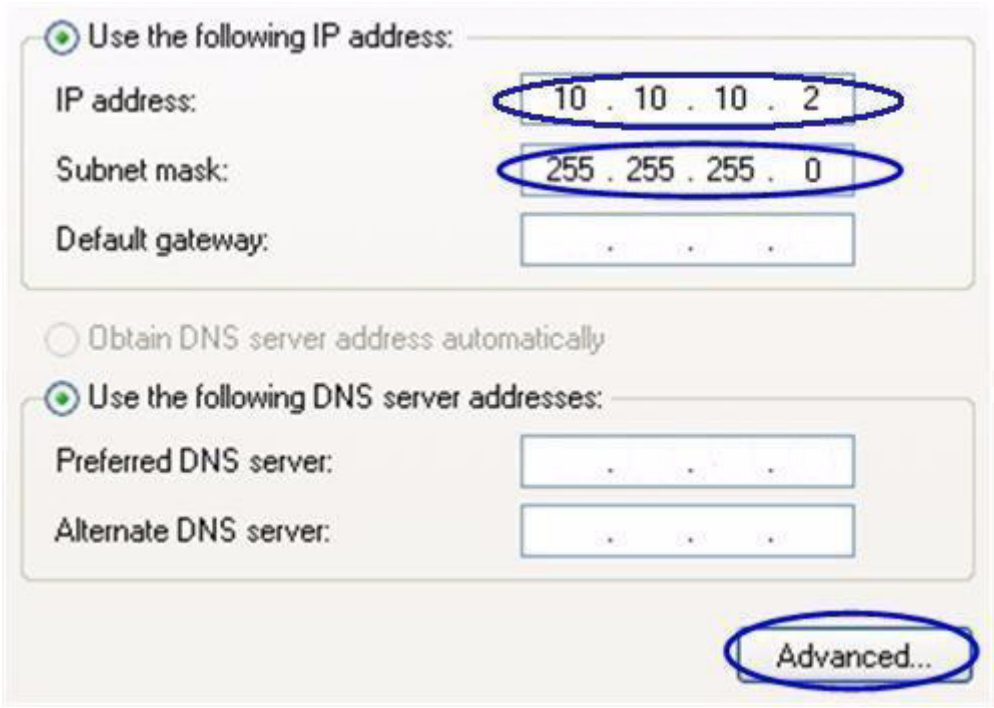


Figure 2-14: Changing the IP Address

6 If you are in a LAN and you do not want to change your primary IP-address so you could keep LAN connectivity, you can assign an alias. In order to do that, press "Advanced..." button (Figure 14). In "Advanced TCP/IP Settings" click "Add" and put alias IP-address and mask (e.g. "10.10.10.2" and "255.255.255.0" correspondingly). See Figure 2-15. Click **OK** in all windows opened in the described procedure.

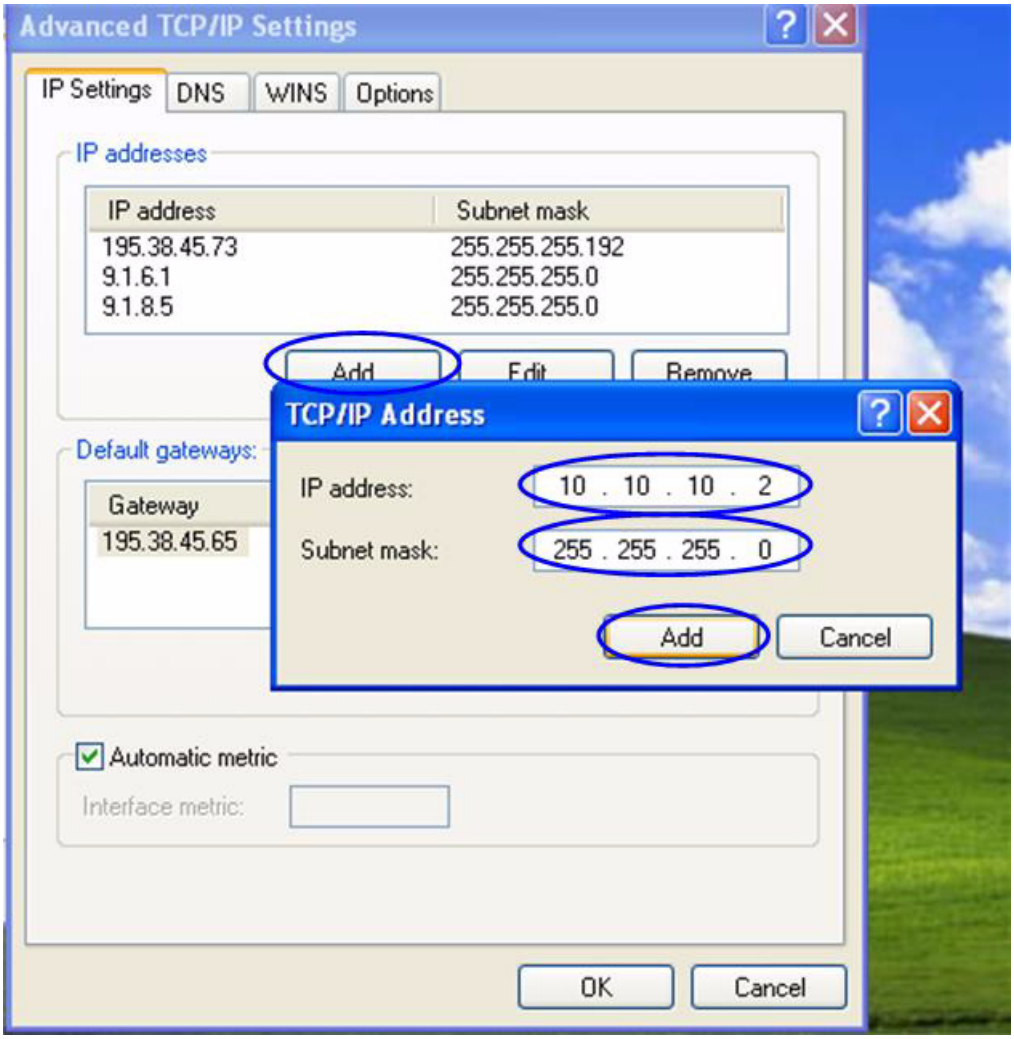


Figure 2-15: Creating an Alias

7 Run "Telnet" utility using "Start->Run" and typing "telnet IP-address" where IP-address is either the IP-address configured at Step 5 or alias configured at Step 6.

8 Follow Steps 9 to 11 of "Accessing the Unit via Console" on page 11 section in order to change the IP-address on the **eth0** interface on the unit to the desired one.

2.2 Initial Setup

Once you have got the access to the unit via Telnet, you can perform initial unit setup. Run telnet application (Start->Run) using IP-address that was assigned on the **eth0** interface of the unit (for example, 9.1.8.1)

First of all, let us list some useful commands that should be remembered.

- "**help**" - lists all available commands in the unit
- "**config show**" (or "**co sh**" for short) - shows unit's current configuration
- "**config save**" (or "**co sa**" for short) - saves unit's current configuration
- "**restart y**" - immediate unit reboot. Reboot lasts for 20-30 seconds (approximately) and during this time you will not be able to control it over Telnet. "**restart XX**" can be used for a postponed reboot so the unit will be rebooted in XX seconds (this is very helpful when there is a risk of loosing a remote unit while performing risky manipulations with configuration). "**restart 0**" cancels postponed reboot.
- "**quit**" - closes current telnet session

2.2.1 System Parameters

Once you've got access to the unit, the most common thing to be done in the first turn is to set up some basic system parameters:

- System name. System name is specified by the following command:
  system name [system_name]
- System user. This parameter will be used as a login:
  system user [user_name]
  After specifying a user name you will need to type it the second time for confirmation.
- System password. System password is used as a password while login:
  system password [password]
  After specifying a password you will need to type it the second time for confirmation.

- System prompt. This command will change current command line interface prompt:
  system prompt [any_word]

Also, it may be useful to know firmware version that is currently available in the unit and unit's serial number. "**Sys ver**" command can be used for this purpose (Figure 16):

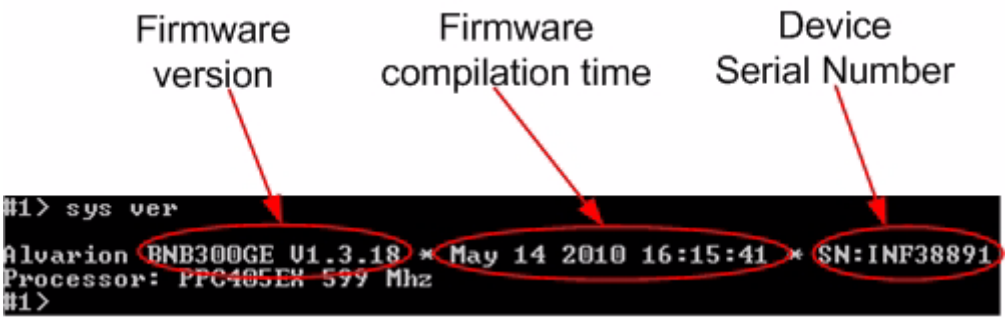


Figure 2-16: System Version

2.2.2 Learning Unit's Capabilities

1. In order to learn current interfaces configuration, execute "**co sh ifc**" command.
2. In order to learn all configured interfaces, their states and statistics, execute "**ifc -a**" command. See Figure 2-17.

Figure 2-17: Interfaces Information

Information on the specific interface can be obtained using "**ifc <IF-NAME>**" command. For example, "**ifc rf5.0**" will give you information on "**rf5.0**" interface.

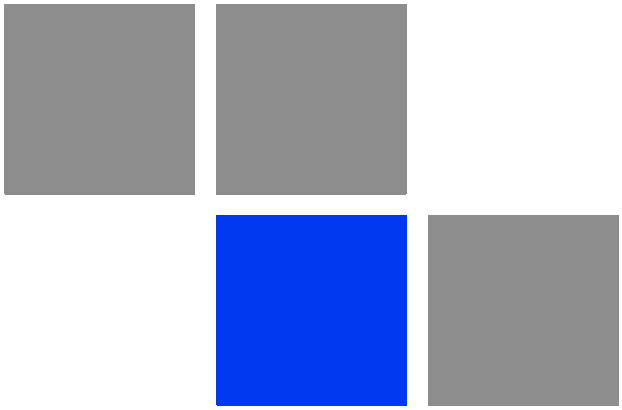
3 In order to get unit's capabilities including available frequency list, transmit power levels, bitrates for the specific radio interface, "**rf <IF-NAME> cap**" command is used. For example, "**rf rf5.0 cap**". See Figure 2-18.

```
#1> rf rf5.0 cap
   Radio capabilities:
   Power levels (dBm):                  min 0 max 18 step 0.5 dBm
                                        (per packet power control supported)
   MAC address:                         000E8E201326
   Bandwidth modes:                     5, 10, 20, 40
   Bitrate list:                        13000, 26000, 39000, 52000,
                                        78000, 104000, 117000, 130000
   Crypto algorithms:                   AES: supported, enabled
   Frequency list (20 MHz):
     4920, 4940, 4960, 4980, 5000, 5020, 5040, 5060, 5080, 5100, 5120, 5140, 5160, 5180, 5200, 5220, 5240, 5260, 5280, 5300, 5320, 5340, 5360, 5380,
     5400, 5420, 5440, 5460, 5480, 5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5700, 5720, 5740, 5760, 5780, 5800, 5820, 5840, 5860,
     5880, 5900, 5920, 5940
```

Figure 2-18: Unit's Capabilities

2.2.3 Radio Module Parameters Configuration

1. Power level changing is accomplished using "**rf <IF-NAME> txpwr <power-level>**" command. For example, "**rf rf5.0 txpwr 18**" sets transmitting power level to 18 dBm. Power level specified in the command should be the one from the list of available power levels.
2. Frequency changing is accomplished using "**rf <IF-NAME> freq <frequency>**" command. For example, "**rf rf5.0 freq 5340**" sets current working frequency to 5340 MHz.
3. Bitrate can be changed using "**rf rf5.0 bitr <bitrate>**" command. For example, "**rf rf5.0 bitr 130000**" sets current bitrate to 130 Mbps.



Chapter 3

Point-to-Point Configuration

In This Chapter:

- "Unit's Configuration" on page 26
- "Learning Connection Status" on page 28
- "Providing IP Connectivity" on page 30
- "Link Throughput Test" on page 38

In our point-to-point configuration example we will build a simple network as shown in Figure 3-1.

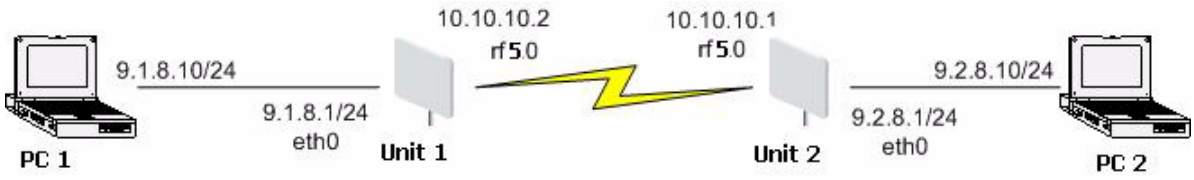


Figure 3-1: Sample Network (PtP Connection)

Here we will set up a connection between two PC/Laptops.

NOTE

All configuration samples and notes will use IP-addresses and names as specified in Figure 3-1.

3.1 Unit's Configuration

1. Choose two units.
2. Provide connectivity from PC1 to Unit1 and PC2 to Unit2 following the procedure described in ""Getting Access to the Unit" on page 7". As a result you should make sure that you can ping/telnet Unit1 from PC1 and ping/telnet Unit 2 from PC2.
3. Now we will proceed to units' configuration. From PC1 enter Unit 1 using Telnet (Start->Run: "**telnet 9.1.8.1**") and from PC2 enter Unit 2 unit ("**telnet 9.1.8.2**").
4. Next step is configuring radio parameters of the radios. As the purpose of this document is to show the basic settings we only will cover essential parameters of the radio so that the connection could be established. In fact, radio has many more other settings not mentioned below:

   - Units should be configured for the same frequency. Example:

     rf rf5.0 freq 5725

   - Set up output power. For lab testing purposes the power can be configured at the minimal value. Example:

     rf rf5.0 txpwr 0

   - Units should have same SID. SID can be chosen as any 8-digit HEX number. Example:

     rf rf5.0 sid 11223344

   - Set up desired working bitrate. Example:

     rf rf5.0 bitr 52000

     Please note that the list of allowed bitrates can be viewed using "rf rf5.0 cap" command and may depend on the unit's modification and selected channel width (these settings are not within the scope of this document).

5. After radio configurations are done, we need to run MINT protocol which is a core of the unit's architecture. On both units the following command should be executed:

   mint rf5.0 start

If radio settings are done properly and units can physically "hear" each other, the units will exchange a series of service packets and establish a connection. In order to check it, one should use a command "**mint map**".

Also, the following configurations may be made in our particular PTP scenario:

- Set up a name for a network node (from MINT standpoint). Example:

  mint rf5.0 -name "Test_Node_1"

- Set up node id (nodes in "**mint map**" will sorted according to this numerical parameter):

  mint rf5.0 -nodeid 1234

- Set up nodes' type.

  One side of the link should be set as "master":

  mint rf5.0 -type master

  The other one as "slave":

  mint rf5.0 -type slave

  When a unit is changed to slave, a default roaming profile is created in its configuration and the band cannot be changed anymore via 'rf rf5.0' command, but only from the profile.

CAUTION

The units cannot make link with default settings, because both of them are "masters".

In order to see current MINT protocol configuration, use "**co show mint**" command.

3.2 Learning Connection Status

Once all configuration steps are correctly performed you should make sure that the connection is established.

Please keep in mind that once MINT protocol is working on MAC-layer (2nd layer of OSI) IP-connectivity needs to be configured after link connectivity is established.

Actually, it makes no sense to connect antennas to the devices while lab testing but still you need to make them "hear" each other. Also you may try inserting some kind of steel paper-clip in the connector - this might help in signal improvement.

In order to learn current connection status, "**mint map**" command should be used.

Example of "**mint map**" command output:

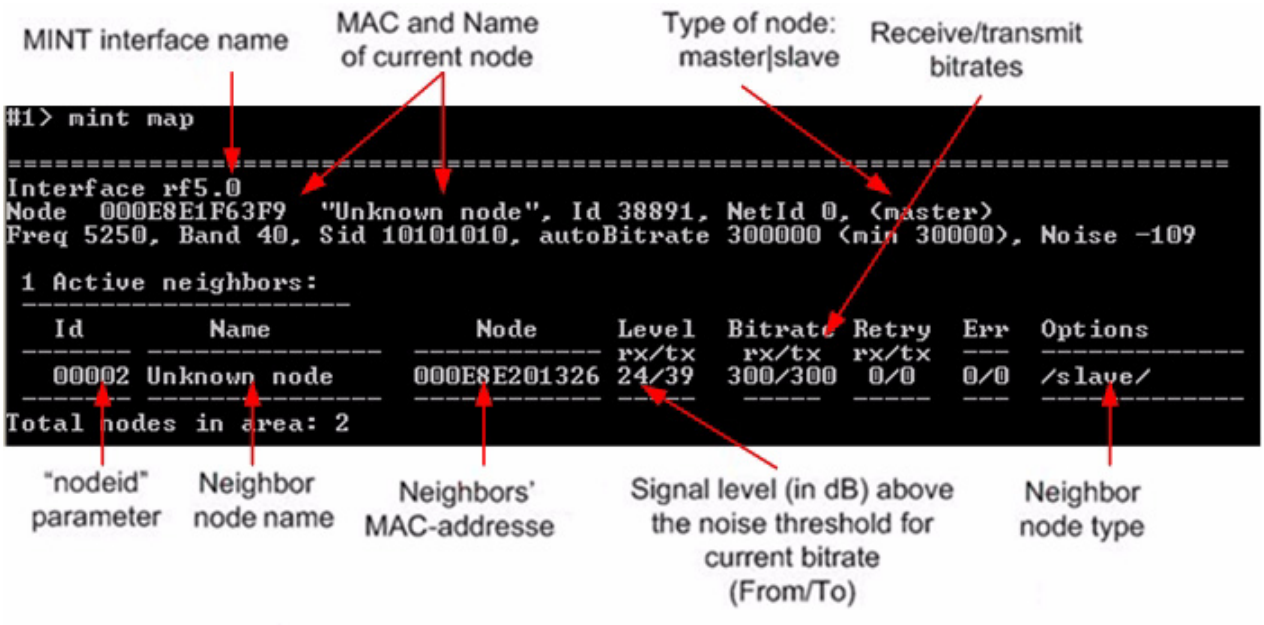

MINT interface name
MAC and Name of current node
Type of node: master|slave
Receive/transmit bitrates
#1> mint map
Interface rf5.0
Node 000E8E1F63F9 "Unknown node", Id 38891, NetId 0, (master)
Freq 5250, Band 40, Sid 10101010, autoBitrate 300000 (min 30000), Noise -109
1 Active neighbors:
Id Name Node Level Bitrate Retry Err Options
rx/tx rx/tx rx/tx
00002 Unknown node 000E8E201326 24/39 300/300 0/0 0/0 /slave/
Total nodes in area: 2
"nodeid" parameter
Neighbor node name
Neighbors' MAC-addresse
Signal level (in dB) above the noise threshold for current bitrate (From/To)
Neighbor node type

Figure 3-2: "mint map" Command

What important information do we learn from "mint map" output?

1. Current unit's neighbor of the device
2. Input / Output signal levels. Here, the parameters are displayed in dB above current noise thresholds which are defined by current bitrates (displayed on the right from signal levels). What is a good signal level (for current bitrate)?

For lower bitrates (equal or less than 52 Mbps) signal levels higher than 12-14 dB can be considered acceptable. For higher bitrates it is recommended to have higher signal levels (>20 dB) in order to have a stable connection on this bitrate and less retries and errors

3 Type of node: master or slave. In order to create PTP link, one unit should be "master" and another one "slave". In this case a non-collision polling protocol can be enabled on the "master" unit.

3.3 Providing IP Connectivity

Once we have connected our two units in a Point-to-Point link, the next step is to configure IP-connectivity.

Units can be configured in either router or switch mode or even in hybrid mode combining router and switch functionality.

In this manual we will review two most simple cases of link configuration in router and switch mode.

3.3.1 Routed Link

In the simplest case, the following should be done to create routed link:

1 Configure two units' eth0 and eth1 (physical Ethernet) interfaces to a different network subnets. In our example the addresses for eth 0 are 8.1.1.2/24 (8.1.1.0/24 network) and 8.1.2.6/24 (8.1.2.0/24 network), for eth1: 1.0.11.5/24 (1.0.11.0/24 network) and 1.0.12.4/24 (1.0.12.0/24 network).

Command example:

ifc eth0 8.1.2.6/24

Please note that after executing this command you will loose the connection to your current telnet session (as you have logged on using different IP-address) and you will need to re-log to the unit and save the configuration with a new IP-address ("**co save**" command saves the configuration).

2 Next step is to configure a subnet between two radio interfaces. In our example we use 10.10.10.0/30 network. One unit's radio interface gets 10.10.10.1 address and another one gets 10.10.10.2 address. Example:

ifc rf5.0 10.10.10.1/30

3 After configuring IP-addresses you can ping the opposite side of the link using addresses assigned to radio interfaces.

4 Next, we need to configure routing between our four subnets which are 8.1.1.0/24, 8.1.2.0/24, 1.0.11.0/24 and 1.0.12.0/24. One can use static or dynamic routing (RIP or OSPF). You can, for example, just enable RIP protocol on both units or use static routing.

To enable RIP protocol on each unit type the following commands:

```
#2> arip start
```

Then enter ARIP router configuration mode:

```
#2> arip
RIP> configure
RIP(config)# router
```

And involve all the unit's interfaces in routing:

```
RIP(config-router)# network eth0
RIP(config-router)# network rf5.0
```

To configure static routing:

On each unit, e.g. on the second unit, which has 8.1.2.6/24 address on eth0 (Ethernet) and 10.10.10.2/30 on the radio interface (rf5.0) the command will look as follows:

```
route add 8.1.1.0/24 10.10.10.1
```

which will mean that the network 8.1.1.0/24 is accessible via 10.10.10.1 address.

At this point, you can reach (e.g. ping) remote's **eth0** interface both from one unit to another.

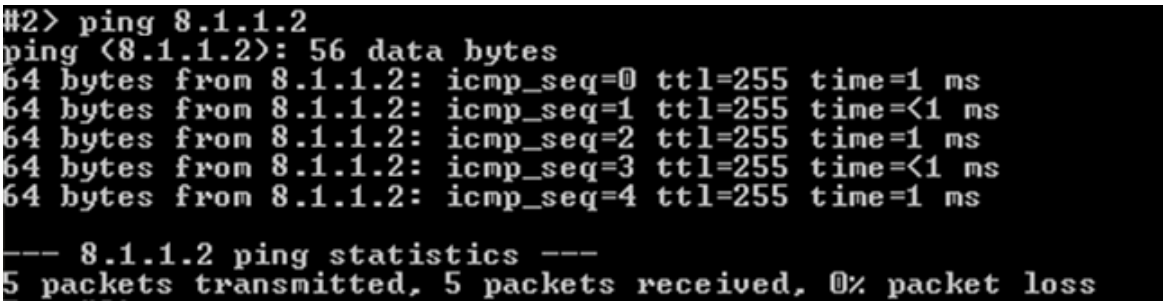

#2> ping 8.1.1.2
ping (8.1.1.2): 56 data bytes
64 bytes from 8.1.1.2: icmp_seq=0 ttl=255 time=1 ms
64 bytes from 8.1.1.2: icmp_seq=1 ttl=255 time=<1 ms
64 bytes from 8.1.1.2: icmp_seq=2 ttl=255 time=1 ms
64 bytes from 8.1.1.2: icmp_seq=3 ttl=255 time=<1 ms
64 bytes from 8.1.1.2: icmp_seq=4 ttl=255 time=1 ms
--- 8.1.1.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss

Figure 3-3: Pinging Remote's Ethernet

The next step is to make you Laptops/PC/LAN "see" each other.

If you connect two PC/Laptops (for example, Windows-basic) two options are available in this case:

1 Write a route to the corresponding Ethernet network at the opposite side of the link. In order to do this, go "Start->Run" and run "cmd" - Command Line. At the computer connected to the first unit you should write the following:

route add 8.1.2.0 mask 255.255.255.0 8.1.1.2

This means that when an IP-packet goes from the computer connected to your first device to the computer at the second side, it will go to the first device Ethernet interface. In the unit, according to the routing tables formed using RIP protocol, the packet will be sent via radio to the second unit. After that, second unit will look up in its routing tables and send the packet through its Ethernet interface to the remote computer.

At the second computer you should perform similar actions. Go "Start->Run" and run "cmd" command. Type the following:

route add 8.1.1.0 mask 255.255.255.0 8.1.2.6

Now we provided connectivity between two computers.

NOTE

All routes in Windows that are specified using **route** command have power until next reboot of the computer (special parameter "-p" should be used to make a route permanent). To see the routing table in Windows "**route print**" command should be used.

2 The second option is to specify a **default gateway** for the PC/Laptop which is going to be an **Ethernet** interface of the connected unit. You can specify default gateway parameter in the window shown on Figure 14. Please refer. For the first side it will be **8.1.1.2**, for the second - **8.1.2.6**

In order to make sure that your PC/Laptops are connected, you can ping one side from the other one. For example, from one PC/laptop (located at one side of the link) we are pinging remote computer at the opposite side.

IMPORTANT

IP-packets originated from the unit itself (e.g. ping, telnet, FTP, SNMP) are assigned an IP-address (primary) of the interface through which they leave the unit. In order for all IP-packets have one defined IP source address the following command can be used:

sys OfficialAddress IP

Here, "IP" is the Official Address of the unit should be specified which will act as a source IP address for all the packets originated from the unit.

3.3.1.1 Sample Point-to-Point Router Configuration

```
#System parameters
 sys name Unknown node
 sys user admin
 setpass

#Radio module parameters
 rf rf5.0 band 20
 rf rf5.0 freq 5340 bitr 130000 sid 10101010
 rf rf5.0 txpwr 18 pwrctl

#Interfaces parameters
 ifc lo0 127.0.0.1/8
 ifc eth0 media auto mtu 1500 up
 ifc eth0 8.1.1.2/24
 ifc rf5.0 mtu 1500 up
 ifc rf5.0 10.10.10.1/30

#QoS manager
 qm option rtp nodot1p notos noicmp notcpack nostrict

#DFS configuration
 dfs rf5.0 dfsoff
 dfs rf5.0 freq auto
 dfs rf5.0 cot 00:00

#MINT configuration
 mint rf5.0 -name "Unknown node"
 mint rf5.0 -nodeid 38891
 mint rf5.0 -type master
 mint rf5.0 -mode fixed
 mint rf5.0 -authmode public
 mint rf5.0 -crypt aes
 mint rf5.0 -autobitrate -6
 mint rf5.0 -minbitrate 13000
 mint rf5.0 -hiamp 6 -loamp 2
 mint rf5.0 -log
 mint rf5.0 -airupdate passive normal
 mint rf5.0 -roaming leader
 mint rf5.0 -rcmdserver disabled -guestKey "" -fullKey ""
 mint rf5.0 start


#MAC Switch config
 switch group 1 add 1 eth0 rf5.0
 switch group 1 stp on
 switch group 1 start

 switch admin-group 1
 switch start

#HTTP configurator
 webcfg start

#DHCP client configuration
 dhcpc eth0 start

#ARDA configuration
 arda interface eth0
 arda interface lo0
 arda interface null0
 arda interface rf5.0
 arda end

#ARDA RIP configuration
 arip start
 arip router
 arip  network eth0
 arip  network rf5.0
 arip end
```

Figure 3-4: First Device

```
#System parameters
 sys name Unknown node
 sys user admin
 setpass

#Radio module parameters
 rf rf5.0 band 20
 rf rf5.0 freq 5340 bitr 130000 sid 10101010
 rf rf5.0 txpwr 18 pwrctl

#Interfaces parameters
 ifc lo0 127.0.0.1/8
 ifc eth0 media auto mtu 1500 up
 ifc eth0 8.1.2.6/24
 ifc rf5.0 mtu 1500 up
 ifc rf5.0 10.10.10.2/30

#QoS manager
 qm option rtp nodot1p notos noicmp notcpack nostrict

#DFS configuration
 dfs rf5.0 dfsoff
 dfs rf5.0 freq auto
 dfs rf5.0 cot 00:00

#MINT configuration
 mint rf5.0 -name "Unknown node"
 mint rf5.0 -nodeid 37629
 mint rf5.0 -type slave
 mint rf5.0 -mode fixed
 mint rf5.0 -authmode public
 mint rf5.0 -crypt aes
 mint rf5.0 -autobitrate -6
 mint rf5.0 -minbitrate 13000
 mint rf5.0 -hiamp 6 -loamp 2
 mint rf5.0 -log
 mint rf5.0 -airupdate passive normal
 mint rf5.0 prof 1 -freq 5340 -sid 10101010 -bitr 130000 -band 20 \
              -nodeid 37629 -type slave -netid 0 -autobitr -6
 mint rf5.0 -roaming enable
 mint rf5.0 -rcmdserver disabled -guestKey "" -fullKey ""
 mint rf5.0 start


#MAC Switch config
 switch group 1 add 1 eth0 rf5.0
 switch group 1 stp on
 switch group 1 start

 switch admin-group 1
 switch start

#HTTP configurator
 webcfg start

#DHCP client configuration
 dhcpc eth0 start

#ARDA configuration
 arda interface eth0
 arda interface lo0
 arda interface null0
 arda interface rf5.0
 arda end

#ARDA RIP configuration
 arip start
 arip router
 arip  network eth0
 arip  network rf5.0
 arip end
```

Figure 3-5: Second Device

3.3.2 Switched Link

MINT architecture has an ability of using switching capabilities. Switch, realized in the units, is a very powerful tool that can be used in many different scenarios but in this particular example we will be using it for one simple purpose - create a simple switched link. The following steps should be taken:

1. Configure IP-addresses (e.g. on eth0 interface) from the same subnet. Say, 9.1.8.1/24 for the first unit and 9.1.8.2/24 for the second one.
2. On both units the switch needs to be configured. Although, switch realized in the units is a powerful tool and can be used for many different purposes, here in our example, we will use the simplest configuration which turns the unit to a full switch mode. The following set of commands should be executed on both units in the link:

   switch group 1 add eth0 rf5.0

   switch group 1 start

   switch admin-group 1

   switch start

3.3.2.1 Sample Point-to-Point Switch Configuration

```
#System parameters
 sys name Unknown node
 sys user admin
 setpass

#Radio module parameters
 rf rf5.0 band 20
 rf rf5.0 freq 5340 bitr 130000 sid 10101010
 rf rf5.0 txpwr 18 pwrctl

#Interfaces parameters
 ifc lo0 127.0.0.1/8
 ifc eth0 media auto mtu 1500 up
 ifc eth0 9.1.8.1/24
 ifc rf5.0 mtu 1500 up

#QoS manager
 qm option rtp nodot1p notos noicmp notcpack nostrict

#DFS configuration
 dfs rf5.0 dfsoff
 dfs rf5.0 freq auto
 dfs rf5.0 cot 00:00

#MINT configuration
 mint rf5.0 -name "Unknown node"
 mint rf5.0 -nodeid 38891
 mint rf5.0 -type master
 mint rf5.0 -mode fixed
 mint rf5.0 -authmode public
 mint rf5.0 -crypt aes
 mint rf5.0 -autobitrate -6
 mint rf5.0 -minbitrate 13000
 mint rf5.0 -hiamp 6 -loamp 2
 mint rf5.0 -log
 mint rf5.0 -airupdate passive normal
 mint rf5.0 -roaming leader
 mint rf5.0 -rcmdserver disabled -guestKey "" -fullKey ""
 mint rf5.0 start


#MAC Switch config
 switch group 1 add 1 eth0 rf5.0
 switch group 1 stp on
 switch group 1 start

 switch admin-group 1
 switch start

#HTTP configurator
 webcfg start

#DHCP client configuration
 dhcpc eth0 start
```

Figure 3-6: First Device

```
#System parameters
 sys name Unknown node
 sys user admin
 setpass

#Radio module parameters
 rf rf5.0 band 20
 rf rf5.0 freq 5340 bitr 130000 sid 10101010
 rf rf5.0 txpwr 18 pwrctl

#Interfaces parameters
 ifc lo0 127.0.0.1/8
 ifc eth0 media auto mtu 1500 up
 ifc eth0 9.1.8.2/24
 ifc rf5.0 mtu 1500 up

#QoS manager
 qm option rtp nodot1p notos noicmp notcpack nostrict

#DFS configuration
 dfs rf5.0 dfsoff
 dfs rf5.0 freq auto
 dfs rf5.0 cot 00:00

#MINT configuration
 mint rf5.0 -name "Unknown node"
 mint rf5.0 -nodeid 37629
 mint rf5.0 -type slave
 mint rf5.0 -mode fixed
 mint rf5.0 -authmode public
 mint rf5.0 -crypt aes
 mint rf5.0 -autobitrate -6
 mint rf5.0 -minbitrate 13000
 mint rf5.0 -hiamp 6 -loamp 2
 mint rf5.0 -log
 mint rf5.0 -airupdate passive normal
 mint rf5.0 prof 1 -freq 5340 -sid 10101010 -bitr 130000 -band 20 \
              -nodeid 37629 -type slave -netid 0 -autobitr -6
 mint rf5.0 -roaming enable
 mint rf5.0 -rcmdserver disabled -guestKey "" -fullKey ""
 mint rf5.0 start


#MAC Switch config
 switch group 1 add 1 eth0 rf5.0
 switch group 1 stp on
 switch group 1 start

 switch admin-group 1
 switch start

#HTTP configurator
 webcfg start

#DHCP client configuration
 dhcpc eth0 start
```

Figure 3-7: Second Device

3.4 Link Throughput Test

The most evident way to test link throughput is to install FTP server on either first or second computer.

During link throughput test using PC or Laptop with MS Windows please note the following:

1. Hard disk drive speed or Ethernet adaptor speed may become a bottleneck of the system at either side.
2. In MS Windows you need to run several (3 or more) TCP or UDP streams to load up the radio link. In this case you will obtain a correct result.

Log on to FTP server on the remote computer. To do that go "Start->Run" and execute "**ftp 9.1.8.10**". IP-address **9.1.8.10** is the address of the remote computer. Enter login and password for the FTP-server.

Run several FTP streams from the remote computer. In order to do that create several FTP sessions according to the procedure described in the previous paragraph and start downloading files from the remote computer (files should be relatively big).

Once the streams are run you can check the throughput using Load Meter utility built into the unit. You can run it on either side. Run it for the **eth0** interface. The command is the following:

loadm -l eth0

"**-l**" parameter means line-by-line output.

The example is shown on the Figure 3-8.

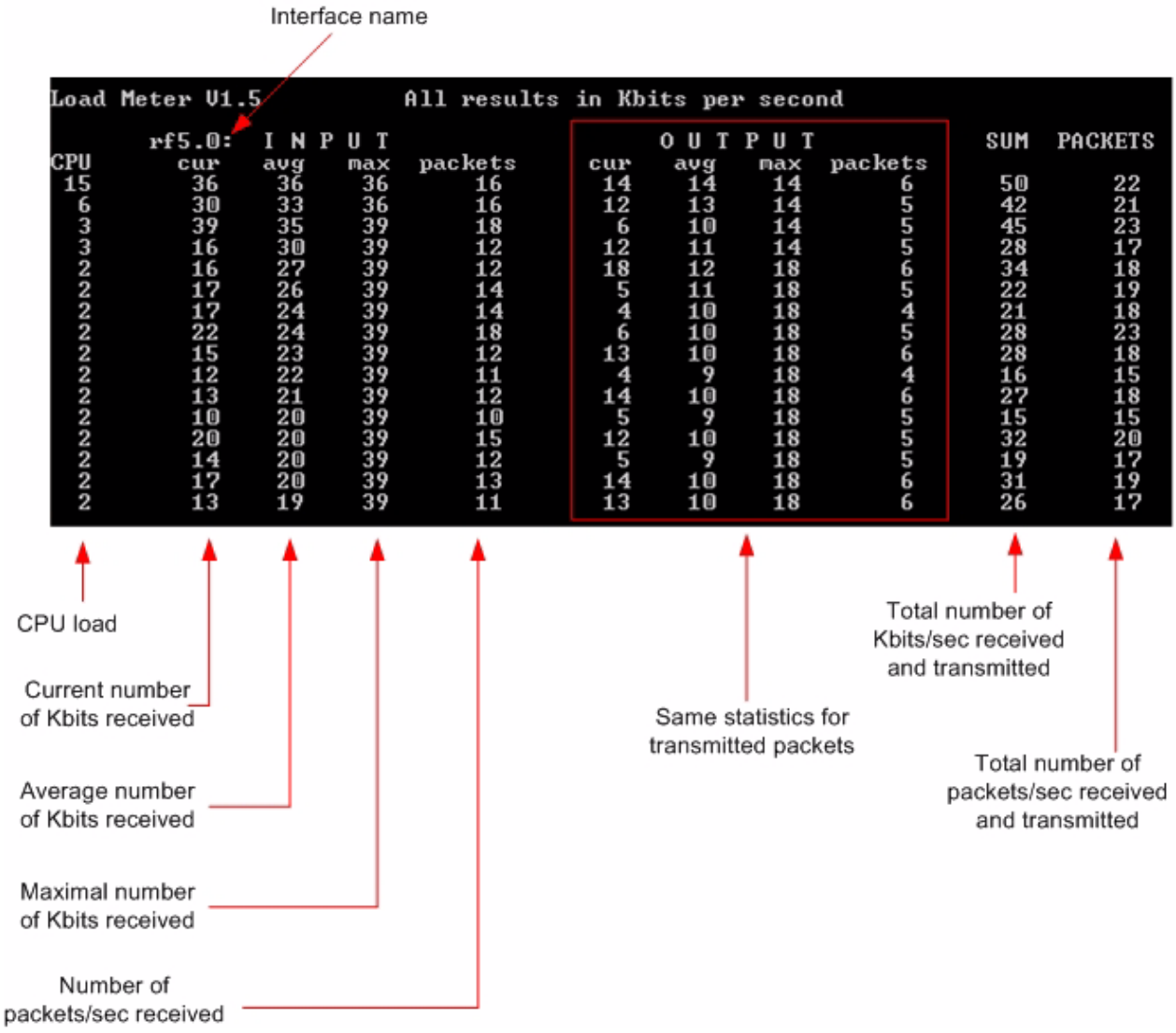

Interface name
Load Meter V1.5 All results in Kbits per second
rf5.0: I N P U T O U T P U T SUM PACKETS
CPU cur avg max packets cur avg max packets
15 36 36 36 16 14 14 14 6 50 22
6 30 33 36 16 12 13 14 5 42 21
3 39 35 39 18 6 10 14 5 45 23
3 16 30 39 12 12 11 14 5 28 17
2 16 27 39 12 18 12 18 6 34 18
2 17 26 39 14 5 11 18 5 22 19
2 17 24 39 14 4 10 18 4 21 18
2 22 24 39 18 6 10 18 5 28 23
2 15 23 39 12 13 10 18 6 28 18
2 12 22 39 11 4 9 18 4 16 15
2 13 21 39 12 14 10 18 6 27 18
2 10 20 39 10 5 9 18 5 15 15
2 20 20 39 15 12 10 18 5 32 20
2 14 20 39 12 5 9 18 5 19 17
2 17 20 39 13 14 10 18 6 31 19
2 13 19 39 11 13 10 18 6 26 17
CPU load
Current number of Kbits received
Average number of Kbits received
Maximal number of Kbits received
Number of packets/sec received
Same statistics for transmitted packets
Total number of Kbits/sec received and transmitted
Total number of packets/sec received and transmitted

Figure 3-8: Load Meter Utility

Chapter 4

Performing Outdoor Testing

In This Chapter:

■ "Learning Link Status/Antenna Alignment Procedure" on page 42

Before carrying out outdoor testing make sure that the equipment is properly configured and tested in the lab. If you use outdoor equipment please prepare service cables to connect IDU and ODU and check them in the lab. Also the following accessories may be very useful while outdoor testing:

1. Console cable to perform configuration on the rooftops/masts, etc
2. Binoculars to locate the opposite side (within reasonable range)
3. Mobile phones at either side to coordinate each others actions
4. Screwdrivers set
5. Soldering iron in case if you have to fix some problems with connectors.
6. Voltage analyzer to reveal cable problems if any

When planning your outdoor testing it is **strongly recommended** to perform calculations using:

- Speed/Range Calculator
- Fade Margin Calculator

How-to-use instructions are located in the Technical User Manual on the CD delivered with the equipment.

4.1 Learning Link Status/Antenna Alignment Procedure

In order to install the equipment, please do the following:

1. Install ODU and antenna at the roof top/mast etc. Connect ODU and antenna using RF cable. If the link is just for testing usage make sure that it is not going to rain or snow (because in this case you do not have to seal the connectors).
2. Even in test link it is highly recommended to provide all grounding. Ground the ODU to the mast/building grounding contour.
3. Usually when installing ODU at the top, the ODU-IDU service cable is already connected to the ODU.
4. Connect ODU-IDU cable to IDU indoors.
5. Provide IDU grounding to the LAN grounding contour.
6. Connect power cable to IDU and plug this cable into the power socket.

Once the power is switched on, you can access the unit via Telnet (all necessary configuration steps were already taken in the lab).

It will take several seconds for units to establish the connection. After this period of time you can check the link status by using "**mint map**" command.

If it turns out that during some significant period of time (1 minute) there is no link, several reasons may be the cause:

- Link fade margin is not sufficient to handle the connection
- Antenna alignment procedure is required in order to establish the connection
- Units are not configured properly
- Installation is made not according to the manual

Even if registration has occurred but signal levels are not enough antenna alignment procedure is strongly recommended.

In both cases (whether there is a link or not) antenna alignment procedure is recommended.

4.1.1 Antenna Alignment with MINT Monitor

NOTE

It is recommended to use "Antenna alignment with Link test" procedure instead of "Antenna alignment with MINT Monitor" procedure.

1 On the unit run **mint IFNAME monitor**. Run it only from ONE side. The command looks as follows (example):

mint rf5.0 monitor

Also, the following options of this command can be used:

"**-s**" option keeps the output on one screen

"**-i SEC**" option defines the periodicity of command's output (1 second by default)

"**MAC**" option is a MAC-address (or several MAC-addresses) which should be monitored (MAC-addresses can be viewed in "**mint map**" command)

2 Antenna alignment should be done only from one side at one time. Align one side, than other side. Use mobile phones to check current signal levels. The output of **mint monitor** command is demonstrated on the Figure 4-1.

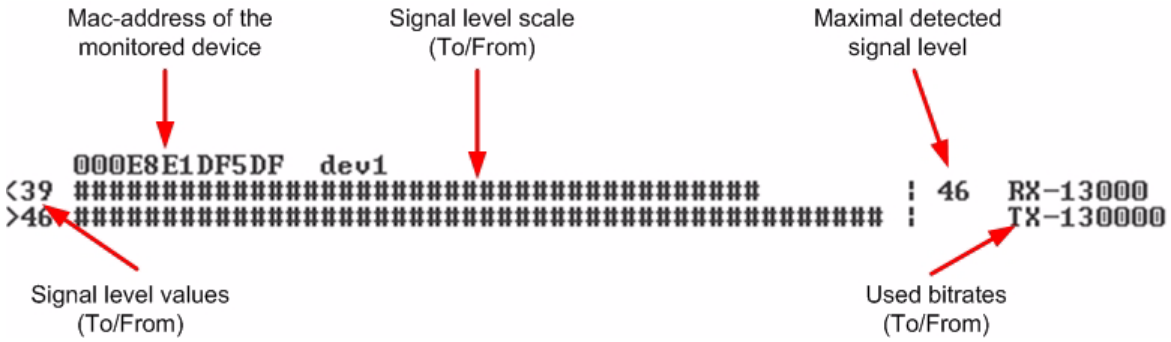


Figure 4-1: "mint monitor" Output

3 The link can be claimed to be working when the following requirements are met:

» Good signal levels. For low bitrates (<=52 Mbps) signal levels of 10-12 dB and higher are appropriate. For higher bitrates (52 Mbps) signal levels of higher than 18-20 dB should be achieved. For QAM64 bitrates (78 Mbps

and higher) signal levels of 30 dB and higher should be achieved for a reliable link

» Low or zero repeats and errors. Please use "**muf stat**" command to see statistics on errors. "**muf stat clear**" command clears the statistics.

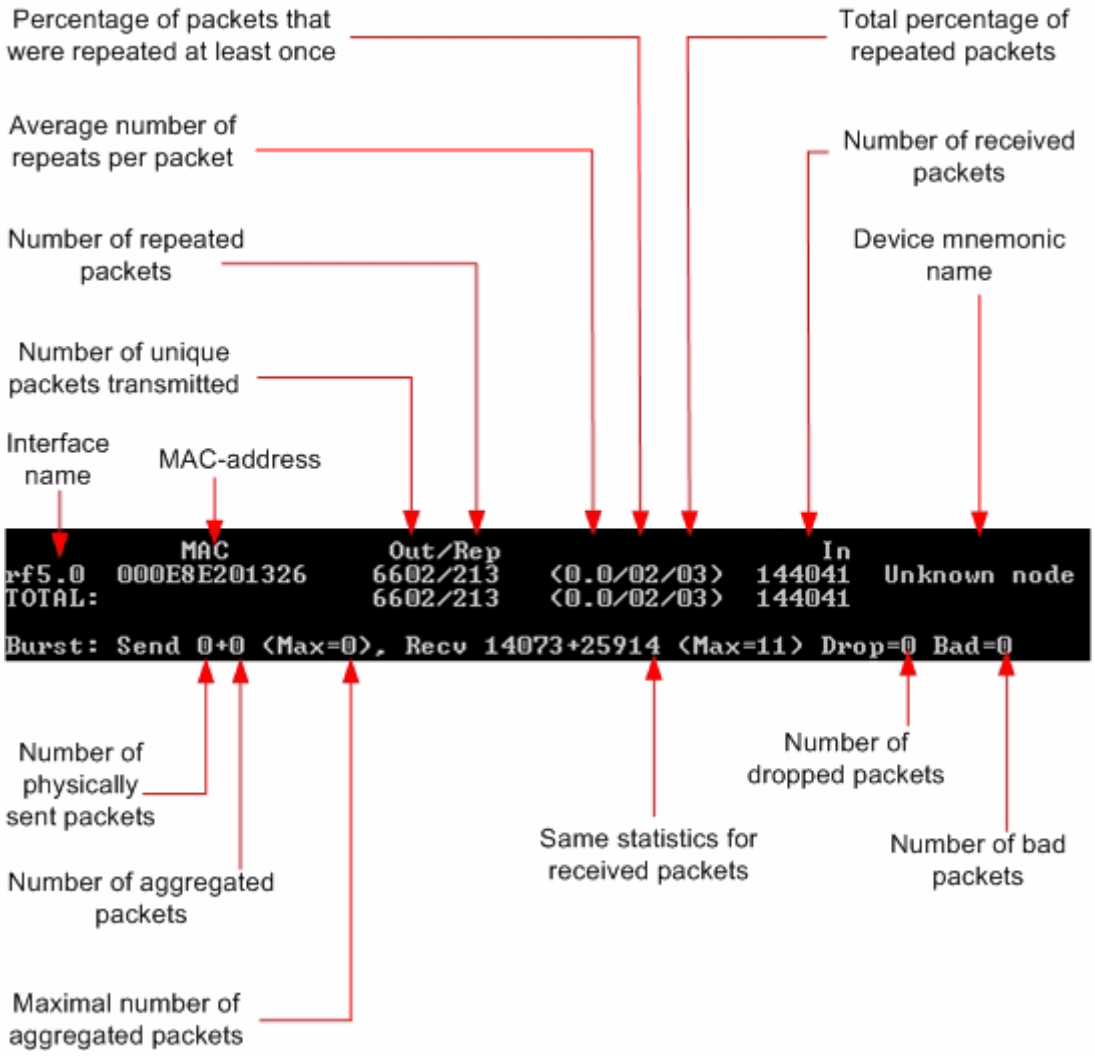

Percentage of packets that were repeated at least once
Total percentage of repeated packets
Average number of repeats per packet
Number of received packets
Number of repeated packets
Device mnemonic name
Number of unique packets transmitted
Interface name
MAC-address
MAC Out/Rep In
rf5.0 000E8E201326 6602/213 (0.0/02/03) 144041 Unknown node
TOTAL: 6602/213 (0.0/02/03) 144041
Burst: Send 0+0 (Max=0), Recv 14073+25914 (Max=11) Drop=0 Bad=0
Number of physically sent packets
Number of aggregated packets
Maximal number of aggregated packets
Same statistics for received packets
Number of dropped packets
Number of bad packets

Figure 4-2: "muf stat" Command Output

» Link stability. Please check system log ("**sys log show**") if remote sides of the link are permanently connected

Keep in mind that the antenna alignment should be performed slowly and with pauses.

Also, important to remember that "**mint monitor**" command is a passive command and does not generate any traffic. Thus, it is recommended to put some load on the link while using "**mint monitor**"

4 Interference can be a possible reason for the link quality degradation (number of repeats increases, lower signal levels due to higher noise levels or other equipment working in the same area).

4.1.2 Antenna Alignment with Link Test

It is recommended to use "Antenna alignment with Link test" procedure instead of "Antenna alignment with MINT Monitor" procedure because Link test is much better radio link testing tool then Mint Monitor. This is so because of the following reasons:

- With Link test tool you are getting much more testing statistics using only one command.
- Link test tool perform "active testing", i.e. it generates special testing traffic itself and then analyze radio link quality according to it. MINT Monitor doesn't do that.
- For Link test no MINT configuration needed.

Procedure:

1 On the unit run **Link test**. The command looks as follows:

ltest IFNAME MAC

Also, the following options of this command can be used:

"**IFNAME**" radio interface name which will be used in a test

"**MAC**" option is a MAC-address of the remote device on the opposite side of the radio link

Example:

```
lt rf5.0 00179AC2F3E6
```

This command illustrates the simplest way to start link test. "lt" command with all parameters undefined (default parameters) starts test of a local device with a remote device which have "00179AC2F3E6" MAC-address.

2 Antenna alignment should be done only from one side at one time. Align one side, than other side. Use mobile phones to check current signal levels. The output of **ltest** command is demonstrated on the Figure 4-3.

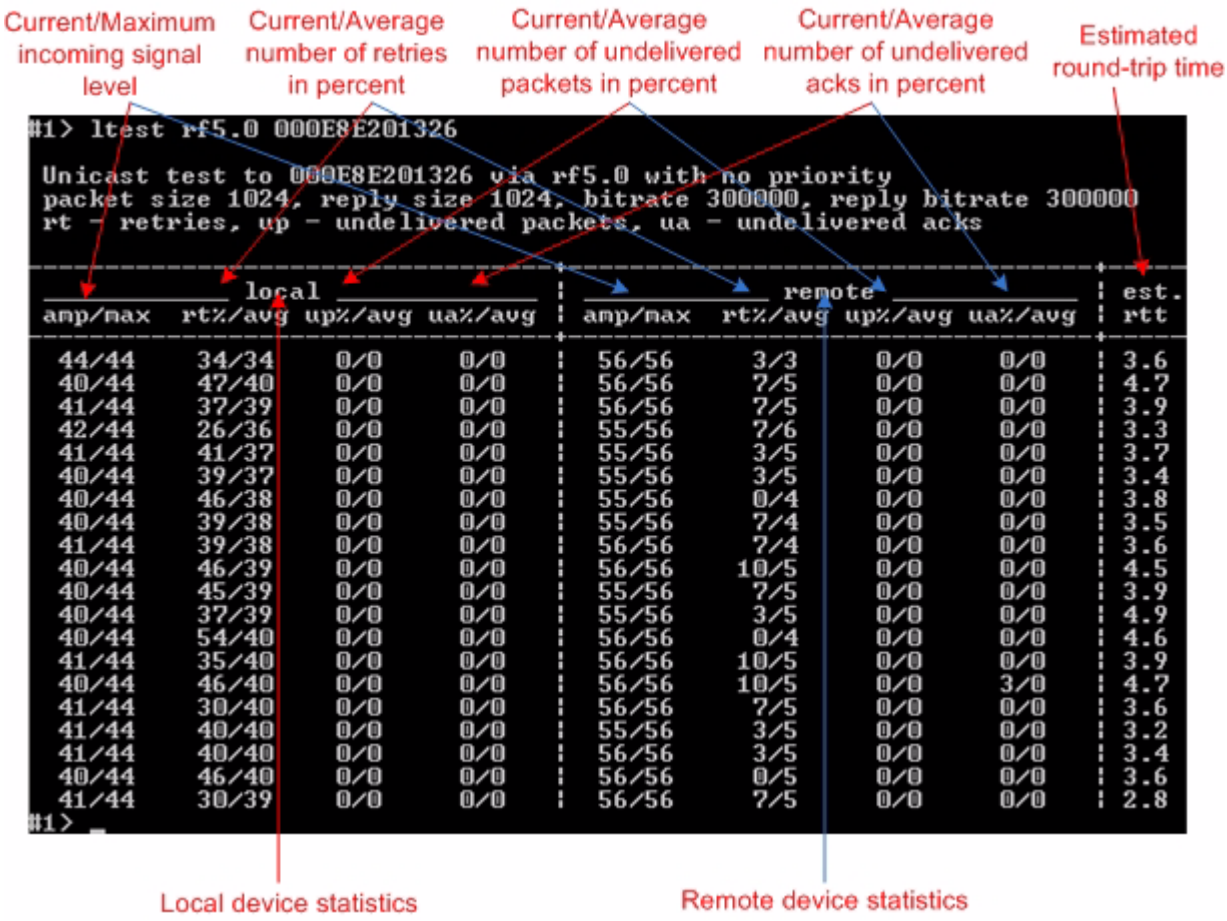


Figure 4-3: "ltest" Output

3 The link can be claimed to be working when the following requirements are met on both sides of a radio link (local and remote):

» Good signal levels. For low bitrates (<=52 Mbps) signal levels of 10-12 dB and higher are appropriate. For higher bitrates (52 Mbps) signal levels of higher than 18-20 dB should be achieved. For QAM64 bitrates (78 Mbps

and higher) signal levels of 30 dB and higher should be achieved for a reliable link

- Low or zero number of retries, undelivered packets and acks ("rt%", "up%", "ua%" columns).
- Link stability. Please check the continuity of all the values in the statistics output of "ltest" command.

  Keep in mind that the antenna alignment should be performed slowly and with pauses.

4. Interference can be a possible reason for the link quality degradation (number of repeats increases, lower signal levels due to higher noise levels or other equipment working in the same area).